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### (54) A continuous-cycle sterile bottling plant

(57) The bottling plant of the invention comprises a bottle (3) feed line and a plurality of operative groups (10, 20, 30, 40) each of which is provided with mobile organs which on command act on the bottles (3) transiting on the feed line. Each operative group is provided with a motor for commanding the mobile organs, and comprises a sterile chamber (10a, 20a, 30a, 40a) which is crossed by the bottles (3) and which has walls (4), which is kept slightly pressurized and which constitutes a sterile zone containing part of a relative operative group. At least one wall (4a, 4b) of each sterile chamber sealedly separates the relative sterile zone from the motors for moving the bottles and from the means for commanding the mobile organs of the relative operative group.

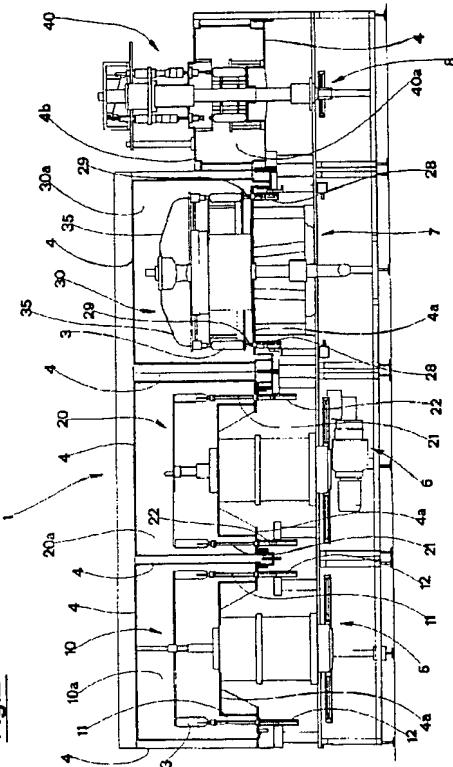


Fig.2

EP 0 758 624 A1

**Description**

The invention relates to a continuous-cycle sterile bottling plant.

This kind of plant is already known, and comprises operative groups acting on bottles transiting along a feed line. In general these plants are provided with a number of successive operative groups, including a sterilizing group, a washing group, a filler group and a capping group.

To guarantee sterile functioning conditions, the whole plant is located in a slightly pressurized atmosphere, in which operators follow and check the operativity of the plant. Obviously the operators wear special garb to prevent contamination of the sterile environment.

At each plant start-up, the environment, or chamber, housing the plant has to be sterilized carefully, while the bottling plant itself has to be completely and scrupulously sterilized both internally and externally. The external parts are cleaned with sterilizing fluids while the internal parts are subject to a mock functioning cycle during which sterilizing fluid instead of product is circulated.

As during a normal plant cycle the filler group heads are opened by the bottle necks and mouths, in order to complete this mock cycle dummy bottles are used, whose function is to open the filler heads. The dummy bottles are loaded by hand by one or more operators; this operation therefore involves considerable preparation time as there is a considerable number of dummy bottles to be loaded.

The main drawbacks exhibited by known-type plants are represented, apart from the obvious irritation of the operators at having to wear overalls, by the complexity and lengthiness of the sterilizing operations at machine start-up, and the difficulty and expense incurred at having to keep the environment (of considerable size) containing the plant in conditions of sterility.

The main aim of the invention is to obviate the above-mentioned drawbacks in the prior art by providing a sterile bottling plant which is rapidly and easily sterilizable and which can be kept sterile in a sure but relatively simple and economical way.

An advantage of the invention is that it relieves operators of the need to wear protective garb. A further aim of the invention is to provide a sterilizing method for the bottle filler group which is both simple and economical, as well as a filler group for using with said method.

The above aims and advantage and others besides are all achieved by the plant, by the filler group and by the method of the present invention, as it is characterized in the claims that follow.

Further characteristics and advantages of the present invention will better emerge from the detailed description that follows, of an embodiment of the invention, illustrated in the form of a non-limiting example in the accompanying drawings, in which:

figure 1 shows a schematic plan view from above of the plant;

figure 2 is a schematic lateral view from below of figure 1;

figure 3 shows a detail of the filler group of figure 2 in enlarged scale;

figure 4 shows a detail of the capping group of figure 2 in enlarged scale.

With reference to the drawings, 1 denotes in its entirety a continuous-cycle sterile bottling plant comprising a feed line 2 of bottles 3. The bottles 3 are fed one after another to a plurality of operative groups 10, 20, 30, 40, each of which is provided with commandable mobile organs, for acting on the transiting bottles 3. Further, each operative group is provided with motorization for moving the bottles 3 as well as means for commanding the movement of the mobile organs. In the example the plant 1 comprises a sterilizing group 10, a washing group 20, a filler group 30 and a capping group 40. The motors, of known type, for each group are indicated by 5, 6, 7 and 8. Two tilting devices 6' are provided for tilting the bottles 3. The mobile organs of the various groups are also of known type and are denoted by 11, 21, 29 and 44. 11 denotes a vertical pipe for the passage of the sterilizing liquid and 21 denotes a further vertical pipe for the passage of the washing fluid. Each pipe 11 and 21 is vertically slidably with respect to a respective hub 12 and 22 with a sterile barrier. Each pipe 11 and 21 superiorly bears a nozzle which can be inserted into a bottle, and through which the relative sterilizing or washing fluid is injected thereinto by spraying.

Each operative group comprises a respective sterile chamber 10a, 20a, 30a, 40a which is crossed by the bottles 3. Each sterile chamber is enclosed by walls 4 and is kept slightly pressurized, and constitutes a sterile zone containing part of the relative operative group. At least one wall 4a of the walls 4 of each sterile chamber sealedly separates a relative sterile zone from the motor for the movement of the bottles 3 as well as the means for commanding the movement of the bottles 3 and the means for commanding the mobile organs of the relative operative group. The motor and the means for commanding are thus outside the sterile zone. The various sterile chambers for each operative group are interconnected. The sterile chamber 10a of the sterilizing group 10 is kept at a slightly lower pressure than the sterile chambers of the other operative groups. An aperture 13 is provided for placing the sterile chamber 10a for sterilizing in communication with the external atmosphere.

The filler group 30 is rotary and comprises an entrance 31 and an exit 32 for the bottles 3. The filler group 30 is provided with a vertical-axis rotating shaft 25 which rotates a plurality of support organs 33, each of which transports, at each rotation, a bottle 3 from the entrance 31 to the exit 32. Each support organ 33 is vertically mobile on command. A filler head 34 is associated to each support organ 33, which filler head 34 is connected to

means for dispensing the product destined to fill the bottles 3. The means for dispensing comprise a plurality of product dispensing pipes 35. Each filler head 34 opens, dispensing the product, by means of upwards pressure thereon. An annular cam 36 acts on the support organs 33, following a rotation of the latter, to command vertical displacements thereof. The cam 36 acts by means of a plurality of vertical-axis shafts 29, one for each support organ 33, which slide vertically in a hub 28 with a sterile barrier. Each shaft 29 is superiorly solidly connected to a respective support organ 33 and is coupled inferiorly with the cam 36 by means of a wheel 27.

Means for positioning 37 are provided for positioning (on command) the cam 36 in a vertical direction. Further, fixed superiorly to each support organ 33 a contact element 39 is arranged such as to exert an upward pressure on the respective filler head 34 when contact is made there-between, which upward pressure is sufficient to cause the filler head 34 to open. The contact element 39 is preferably forked, and a bottle neck 5' of a bottle to be filled is inserted into the fork. The means for positioning comprise one or more vertical-axis jacks 37 arranged below the cam 36 externally of the sterile zone 30a. Each jack 37 is provided with a vertical-axis rack and a command mechanism, not illustrated. The mechanism can be operated by hand using a gripping organ or crank 38. The upper end of the rack presses on the base of the cam 36 to be lifted. The cam 36 acts on the support organs 33 and consequently on the contact element 39 provided for interacting with the respective filler head 34, opening same. The capping group 40 comprises a vertical-axis central drive shaft 41 and a disc 42 which latter is fixed coaxially to the drive shaft 41 and is provided at a periphery thereof with means for sealing 43 with an upper wall 4b of the relative sterile chamber 40a. The capping group 40 comprises a plurality of rods 44 inferiorly provided with a chuck 45 for capping a respective bottle 3. Each rod 44 is set in rotation by the drive shaft 41 and is mobile on command in a vertical direction passing sealedly through a respective hub 48 with sterile barrier solidly mounted on the disc 42. The capping group 40 is further provided with a cap feed line 46 along which the caps 47 undergo a sterilization operation.

To sterilize the filler group 30, when it is restarted after a pause, the following procedure is observed. The filler heads 34 are supplied with a sterilization fluid. The cam 36 is lifted in order to raise the relative support organs 33 and, consequently, the contact elements 39 which latter exert an upwards pressure against the filler heads 34 which is sufficient to open the filler heads 34. The group is operated in this manner for the length of time necessary for sterilizing the dispensing pipes 35 through which during normal functioning the product to be bottled passes. The sterilization fluid flows into the chamber 30a and is collected at the bottom thereof. If necessary more than one sterilization and washing liquid can be dispensed. During the course of normal func-

tioning of the filler group 30 the jacks 37 are brought into a lowered position so that the contact elements 39 do not interact with the filler heads 34.

The operators stay out of the sterile zones and can thus gain easy access to the motor and the mobile organs of the plant without having to don protective garb.

Thanks to the fact that the sterile chamber 10a of the sterilizing group is kept at a slightly lower temperature with respect to the other sterile chambers, the even-tuality of passage of gas into the other chambers can be precluded. This prevents the sterilization fluids injected into the sterile chamber 10a from spreading into the adjacent chambers.

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### Claims

1. A continuous-cycle sterile bottling plant, comprising:

20 a feed line (2) of bottles (3);  
a plurality of operative groups (10, 20, 30, 40), each of which is provided with commandable mobile organs for acting on bottles (3) transiting on said feed line (2) and a motor for commanding said mobile organs;

characterized in that:

25 each of said plurality of operative groups (10, 20, 30, 40) comprises a sterile chamber (10a, 20a, 30a, 40a) crossed by said bottles (3), which sterile chamber (10a, 20a, 30a, 40a) has walls (4) and is kept slightly pressurized, and represents a sterile zone containing a part of a relative operative group (10, 20, 30, 40);  
at least a wall (4a) of each said sterile chamber sealedly separates a relative sterile zone from said motor and from said means for commanding said mobile organs of said relative operative group.

40 2. A plant as in claim 1, characterized in that it comprises a sterile chamber (10a) for an operative group for sterilizing bottles (3), which sterile chamber (10a) is kept at a slightly lower pressure than said sterile chambers for other operative groups.

45 3. A plant as in claim 1 or 2, comprising an operative group for filling bottles (3) comprising:

50 a plurality of support organs (33) for the bottles (3), mobile on command in a vertical direction, to each of which support organ (33) a filler head (34) is associated, which filler head (34) is connected to a dispensing pipe (35) of a product destined to fill said bottles (3), which filler head (34) opens for dispensing said product follow-

ing an upwards-directed pressure thereon; a cam (36) acting on said support organs (33) for commanding a vertical-direction displacement thereof;

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characterized in that it comprises:

a contact element (39), solidly constrained to each of said support organs (33), conformed and arranged such as to exert on a respective filler head (34) on contact therewith an upwards-directed pressure which is sufficient to cause opening thereof;  
means (37) for positioning on command said cam (36) in a vertical direction.

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4. A plant as in claim 3, characterized in that said means for positioning comprise at least one vertical-axis jack (37) operatively associated with said cam (36).

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5. A plant as in claim 3 or 4, characterized in that said contact element (39) is fork-shaped, and in that a mouth (5') of a bottle (3) to be filled houses therein.

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6. A plant as in any one of the preceding claims, characterized in that:

it comprises an operative group for capping, which comprises a central and vertical-axis drive shaft (41) and a disc (42) which is fixed coaxially to said drive shaft (41) and which is provided at a periphery thereof with means for sealing (43) with an upper wall (4b) of a relative sterile chamber (40a);

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a plurality of rods (44) each inferiorly provided with a chuck (45) for capping a bottle (3) and which are drawn in rotation by said drive shaft (41), which are mobile on command in a vertical direction, each thereof passing sealedly through a respective hub (48) provided with a sterile barrier, mounted solidly to said disc (42).

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7. A filler group for bottles, comprising:

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an entrance (31) and an exit (32) for said bottles (3);

a plurality of support organs (33), each of which moves cyclically on command to transport a bottle (3) from said entrance (31) to said exit (32), each of said plurality of support organs (33) being mobile on command in a vertical direction;

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a plurality of filler heads (34) each of which is associated to one of said support organs (33), each of which filler heads (34) is connected to a dispensing pipe (35) of a product destined to fill the bottles (3), each of which filler heads (34)

opens to dispense said product by means of an upwards pressure thereon;  
a cam (36) which acts on said support organs (33) to cause displacements thereof in a vertical direction;

characterized in that it comprises:

a contact element (39), solidly constrained to each of said support organs (33) and conformed and arranged such as to exert on a respective filler head (34), on contact therewith, an upwards-directed pressure which is sufficient to cause opening thereof;  
means (37) for positioning on command said cam (36) in a vertical direction.

8. A method for sterilizing said filler group (30) of bottles (3) of claim 7, characterized in that it comprises steps of:

supplying the filler heads (34) with a sterilization fluid passing through the dispensing pipes (35) of the product;  
raising the cam (36) in such a way as to raise the contact elements (39) which exert an upward pressure on the filler heads (34) which pressure is sufficient to open said filler heads (34) and dispense said fluid, thus obtaining a sterilization of the dispensing pipes (35) of the product.

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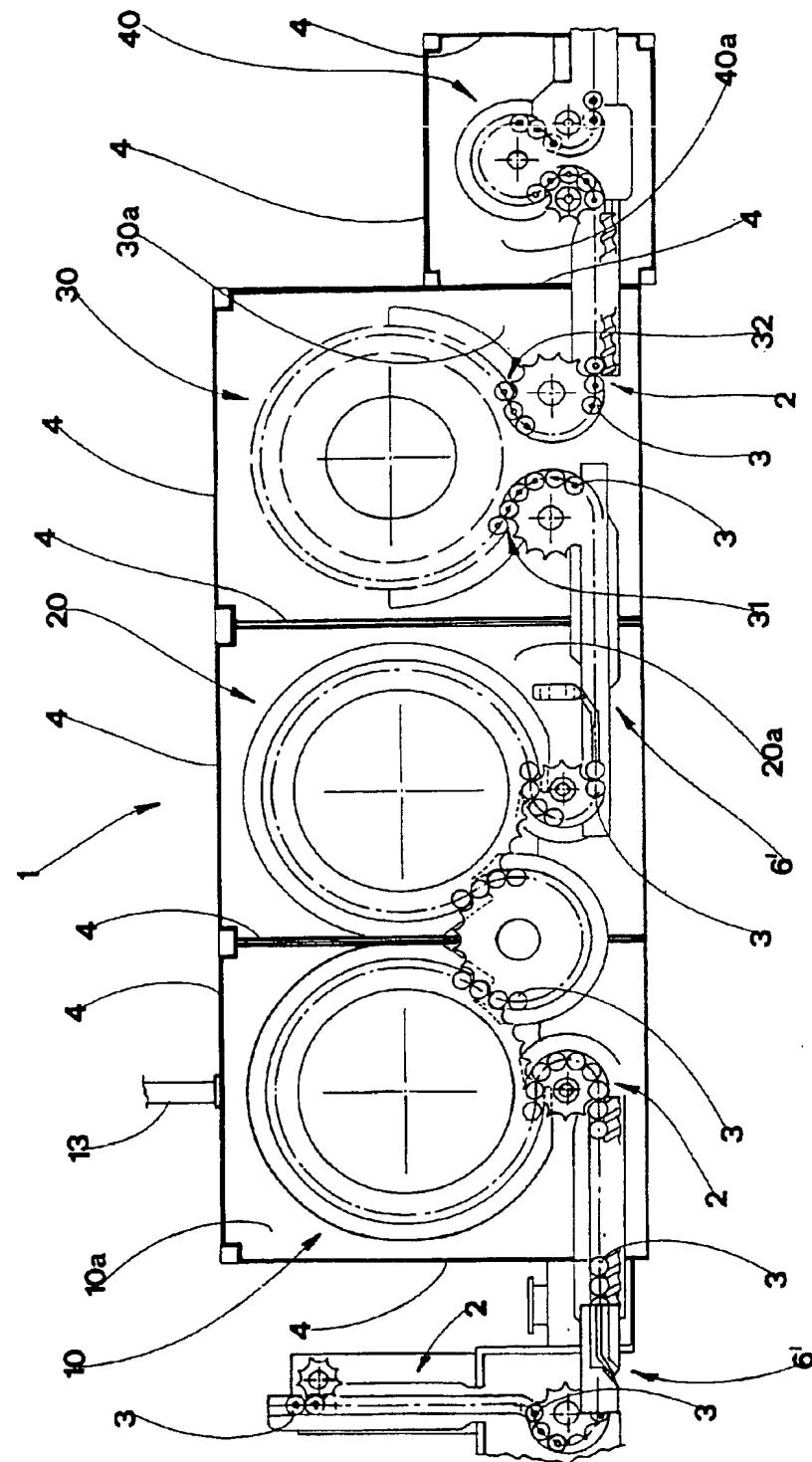
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Fig.1



**Fig. 2**

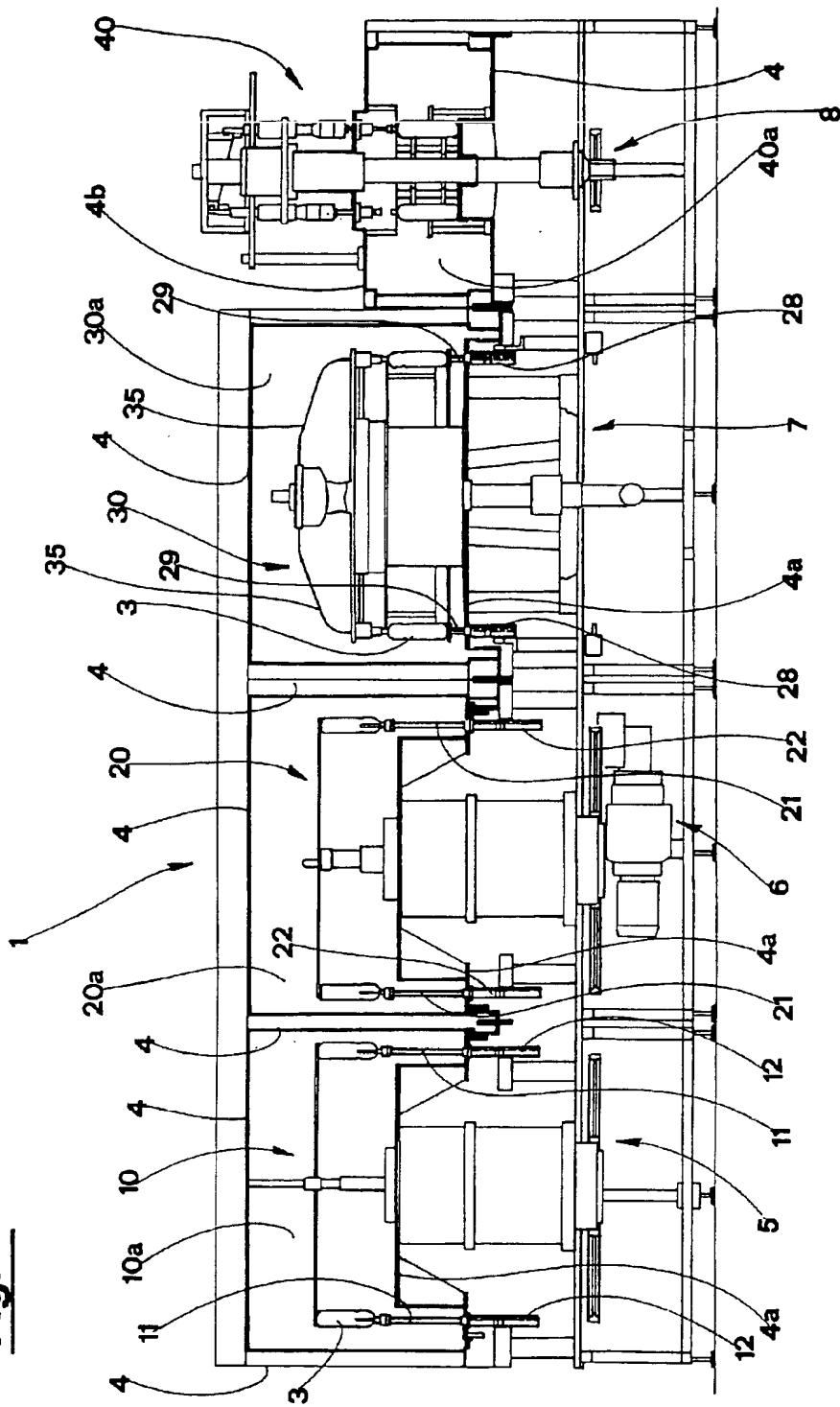


Fig.3

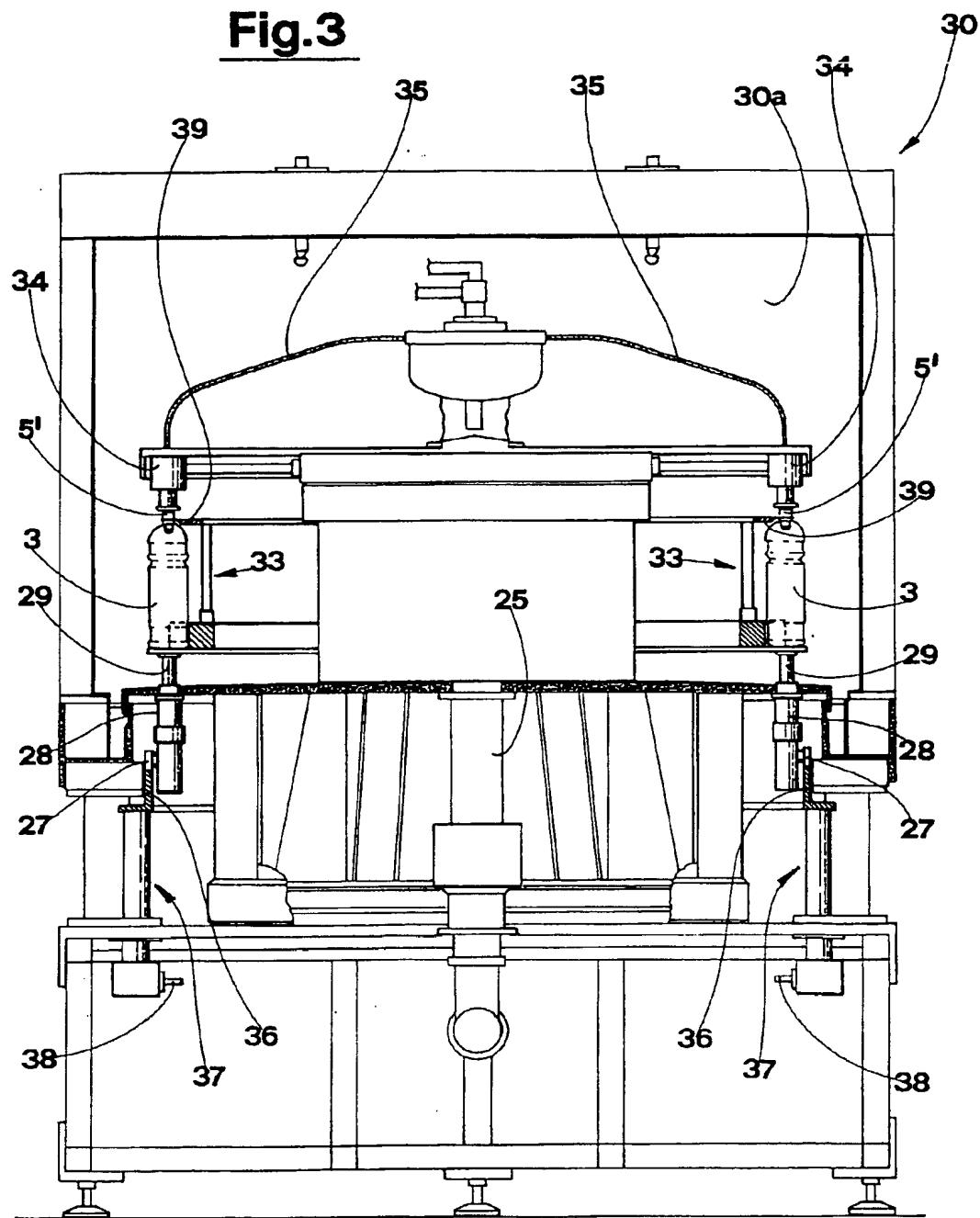
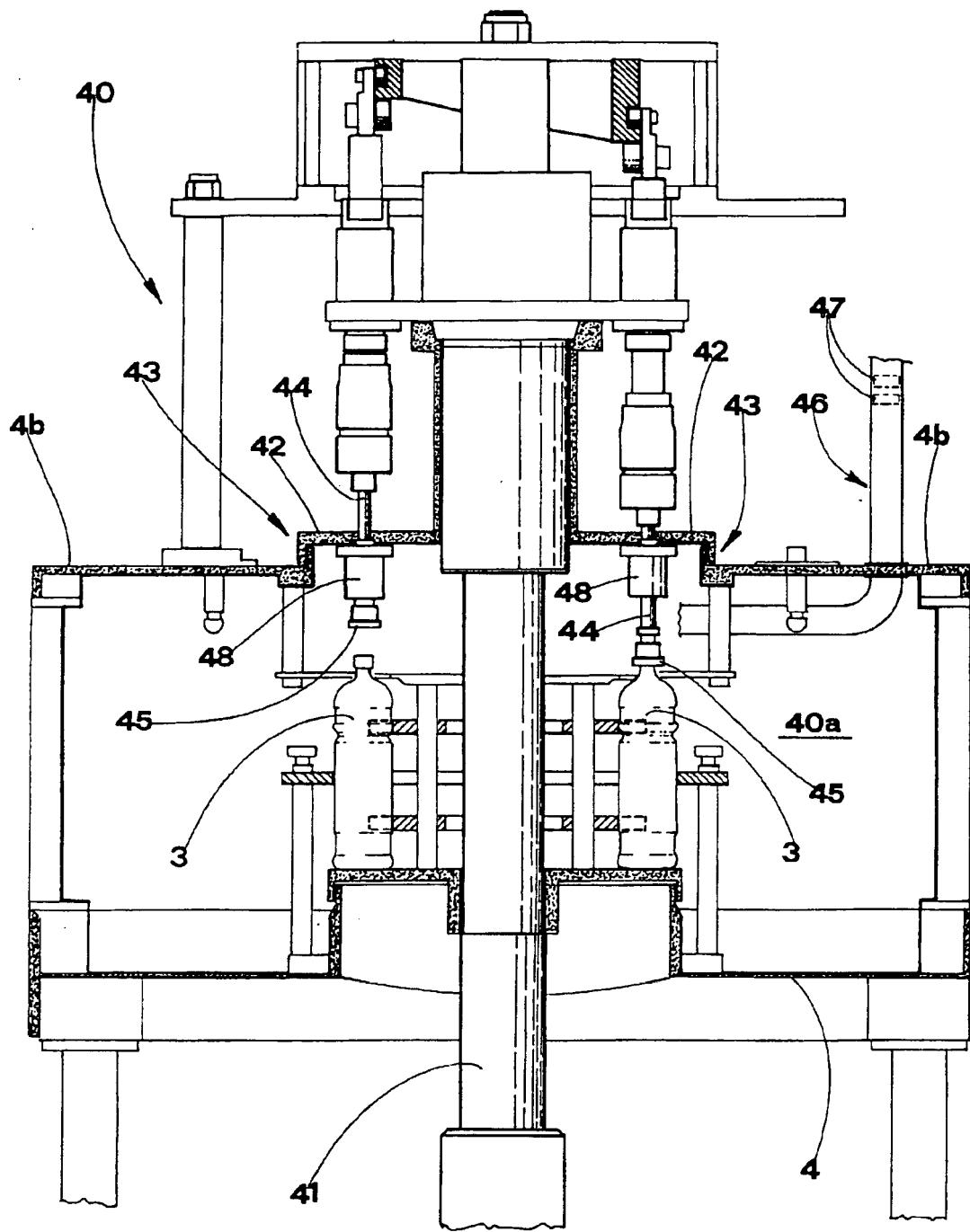


Fig.4





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## EUROPEAN SEARCH REPORT

Application Number  
EP 96 83 0270

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	WO 93 04975 A (MANZINI COMACO S.P.A.) * page 5, line 6 - page 7, line 18 * * figures 1,2 *	1-4,6	B67C7/00 B65B55/02
Y	GB 2 280 669 A (R. SHEPPARD) * page 6, line 1 - line 18 * * figure 1 *	1-4,6	
Y	DE 43 43 425 A (KHS MASCHINEN- UND ANLAGENBAU AG)	3,4	
X	* page 2, line 45 - page 6, line 63 * * figures 1,2 *	7,8	
A	EP 0 518 828 A (MANZINI COMACO S.P.A.) * column 2, line 49 - column 5, line 23 * * figures 1,2 *	1	
A	GB 1 488 428 A (SHIBUYA KOGYO COMPANY LTD) * page 6, line 112 - page 7, line 24 * * figure 12 *	3,4,7,8	
	-----		<b>TECHNICAL FIELDS SEARCHED (Int.Cl.6)</b>
			B67C B65B B08B
<p>The present search report has been drawn up for all claims:</p>			
Place of search	Date of compilation of the search	Examiner	
THE HAGUE	25 November 1996	Smolders, R	
<b>CATEGORY OF CITED DOCUMENTS</b>		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	
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